Neurosurgical Forum LETTERS TO THE EDITOR

How safe, really, is jugular paraganglioma radiosurgery?

TO THE EDITOR: The contribution by Patel et al.² showing excellent control of jugular paragangliomas with a treatment approach including Gamma Knife radiosurgery (GKRS) is welcomed (Patel NS, Carlson ML, Pollock BE, et al: Long-term tumor control following stereotactic radiosurgery for jugular paraganglioma using 3D volumetric segmentation. *J Neurosurg* [epub ahead of print April 13, 2018; DOI: 10.3171/2017.10.JNS17764]). Cranial nerve (CN) and other morbidities potentially associated with gross-total resection can be avoided with the use of radiosurgery. We noted the extremely low rate of new lower CN palsies (3%) after radiosurgery and could not find the baseline rates of tumor-induced or iatrogenic lower CN palsies in their patient cohort.

This information is important for two reasons: first, there may be little advantage (and increased risks both from preoperative embolizations and perioperative complications) to the use of surgery in patients who will require radiation postoperatively.³ The morbidity of surgery is added to the morbidity from irradiation. Second, the true risk of new cranial neuropathies may be higher in patients who are treated with definitive radiosurgery for jugular paragangliomas than was reported by Patel et al.; a nonfunctioning CN before radiosurgery cannot be further injured by the radiosurgical procedure.

In addition, recent reports highlight the possibility of confusing the pathology of an apparent jugular paraganglioma with other entities such as mesenchymal chondrosarcoma¹ or metastatic renal cell carcinoma.⁴ In what situations would the authors recommend performing a biopsy to verify the diagnosis prior to administering radiosurgery?

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Disclosures

The authors report no conflict of interest.

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Response

We thank Drs. Knisely, Ramakrishna, and Schwartz for their insightful comments and questions. We agree that accurate characterization of the risks and anticipated morbidity of single or multimodality treatment is important for patient counseling. In the jugular paraganglioma literature, authors have reported CN function outcomes in a variety of ways. Also, not all cranial neuropathies from tumor or treatment are binary (e.g., partial vs complete paralysis; temporary vs permanent, etc.), further obfuscating data reporting. Additionally, a “gradual onset” cranial neuropathy that may occur due to progressive tumor growth or after radiosurgery, especially as it relates to vagal nerve function, may be well tolerated and even go unnoticed in many patients, whereas the sudden loss of the vagus nerve, as can occur during microsurgery, usually results in more prominent dysphagia and dysphonia. For the sake of simplicity, we originally reported the overall rate of new or worsened cranial neuropathy by using the total number of patients studied as the denominator. We believed that this was the most direct and intuitive method of reporting complications attributable to radiosurgery.

Among patients who underwent primary radiosurgery,

23% had pre-stereotactic radiosurgery (SRS) lower cranial neuropathy resulting from disease progression. Among patients who underwent SRS after prior microsurgical resection, 20% had baseline lower cranial neuropathy prior to any treatment. Iatrogenic lower CN palsy was noted in 32% of patients who underwent surgery either at our institution or elsewhere prior to radiosurgery.

As Drs. Knisely, Ramakrishna, and Schwartz point out, a CN rendered dysfunctional by prior surgery or tumor effect is no longer at risk at the time of radiosurgery. To allow the readers to draw their own conclusion from the data, we have included all available pre- and posttreatment CN function data for all patients treated since 1990 at our institution for analysis (Tables 1 and 2).

When analyzed in this manner, there were 174 CNs (with VII, X, and XII) at risk, with 2 new or worsened palsies. This might suggest a rate of new CN palsy of 1.1%. Alternatively, the rate of lower CN dysfunction would be 1.8% (2 new palsies of 110 CNs, with X and XII at risk). Regardless of how the data are evaluated, it is apparent that the rate of new or worsening CN paralysis is quite low whether SRS is used primarily or after prior microsurgical resection.

We also agree that mimickers of jugular paraganglioma are rare but important clinical entities, and recognize the cited works by Chhabra et al. and Thomas et al. As these authors discuss, imaging techniques can be used to distinguish renal cell carcinoma and chondrosarcoma from jugular paraganglioma. In most cases, we believe that modern contrast-enhanced MRI, combined with high-resolution temporal bone CT, is sufficient to distinguish paraganglioma from other tumors originating in the lateral skull base. Furthermore, diagnostic angiography is helpful to further clarify the diagnosis in select cases. Biopsy via transmastoid or transcanal hypotympanotomy techniques is straightforward and safe, and is certainly reasonable in cases in which the history may suggest alternative pathologies (i.e., a patient with another metastatic tumor or hematological malignancy), tumor growth does not follow the typical trajectory of jugular paraganglioma, cranial neuropathy is out of proportion to tumor size, or the radiological appearance is equivocal. One patient in our series underwent biopsy at another institution because the radiological differential diagnosis included jugular foramen meningioma.

We would also consider biopsy if rapid tumor growth proceeds in spite of radiosurgery. In the cases of primary

TABLE 2. Summary of new or worsened CN dysfunction after GKRS for jugular paraganglioma according to treatment cohort

Cohort	New or Worsened CN Dysfunction		
	CN VII	CN X	CN XII
Primary GKRS (n = 49)	0	0	0
GKRS following primary surgery (n = 31)	0	1 (3.2%)	0
GKRS following prior GKRS or XRT (n = 2)	0	1 (50%)	0
Total	0	2	0

SRS for presumed jugular paraganglioma, it is theoretically possible that we unknowingly treated an alternate pathology. However, because no cases in which SRS failed were found to be something other than paraganglioma on final pathological investigation after salvage surgery, it is reasonable to assume that either: 1) we correctly diagnosed all lesions before SRS, or 2) we may have treated nonparaganglioma lesion(s) with a therapeutic dose of radiation that resulted in growth arrest. Notably, the second and third most common neoplasms that occur at the jugular foramen after paraganglioma are meningioma and schwannoma, which are commonly treated with marginal doses of 16 Gy⁴ and 12.5 Gy,² respectively—similar to that used for jugular paraganglioma.

To the authors' point, we have encountered two unusual pathologies of the jugular foramen worth mentioning. Plasmacytoma of the temporal bone may occur at the jugular foramen and may have very similar imaging characteristics, in addition to manifesting in lower CN palsy. Although the majority of these patients are eventually diagnosed with multiple myeloma, many did not have a known history of myeloma prior to presentation, rendering the diagnosis challenging.^{3,5} A distinguishing factor in this situation was the presence of a second lytic lesion in the occipital bone. In another case, a patient with persistent otorrhea, aural fullness, otalgia, and gait instability was found to have a lytic lesion of the jugular foramen.¹ Tympanomastoidectomy revealed granulomatous inflammation, and biopsies and cultures demonstrated blastomycosis.

We thank the writers for their critical evaluation of our work and hope that our response adds clarity to the manuscript.

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TABLE 1. Summary of functioning CNs at risk prior to GKRS for jugular paraganglioma according to treatment cohort

Cohort	Functioning Nerves at Risk Prior to GKRS		
	CN VII	CN X	CN XII
Primary GKRS (n = 49)	45	37	37
GKRS following primary surgery (n = 31)	17	14	19
GKRS following prior GKRS or XRT (n = 2)	2	2	1
Total	64	53	57

XRT = external-beam radiotherapy.

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MRI and trigeminal neuralgia

TO THE EDITOR: I was interested to read the paper by Brînzeu et al.¹ (Brînzeu A, Droghda L, Sindou M: Reliability of MRI for predicting characteristics of neurovascular conflicts in trigeminal neuralgia: implications for surgical decision making. *J Neurosurg* [epub ahead of print April 6, 2018; DOI: 10.3171/2017.8.JNS171222]). The choice of microvascular decompression (MVD) for treating refractory classical trigeminal neuralgia (TN) relies mostly on preoperative imaging findings, but the degree of reliability of MRI remains a matter of debate. The authors aimed to assess the reliability of MRI and the predictability of neurovascular conflict (NVC) in a series of 100 protocolized MRI studies of patients with TN who underwent MVD, by reexamination of MR images, blinded to the clinical data and surgical findings, including the side of the neuralgia.¹ The results of MRI evaluation were compared with actual surgical findings. The extent of agreement and quality of the prediction were expressed with Cohen's kappa coefficient and receiver operating characteristic (ROC) statistics. Based on their results, the sensitivity of MRI to detect a conflict was 97% and its specificity was 50%. Vessel type was identified with high reliability ($\kappa = 0.80$), while the grade of the conflict and its situation along the root showed poor to average reliability ($\kappa = 0.38$ and $\kappa = 0.40$, respectively). The area under the ROC curve (AUC) for predicting the presence of a conflict according to the grades of conflict seen on MRI was 0.93, which is considered very good. The positive predictive value (PPV) was differentiated according to the grade of conflict, with a very high value for high grades of vascular conflict.¹ The authors concluded an overall good reliability of MRI to predict the existence of an NVC. The prediction value is excellent for high grades of compression.

However, these results are not appropriate estimates to assess reliability and prediction value of MRI. First, it is good to know that two important weaknesses of kappa value to assess agreement are as follows: It depends on the prevalence in each category, which means it can be possible to have different kappa values with the same percentage for both agreement and disagreement cells! Table 1 shows that in both (a) and (b) situations, the prevalence of concordant cells is 90% and that of discordant cells is 10%; however, we get different kappa values (0.44 as mod-

TABLE 1. Limitation of kappa value for assessing the reliability between two examiners' diagnoses with different prevalence (author's own hypothetical data)

Scenario	Examiner 1		Total (%)
	Yes	No	
Situation (a)			
Examiner 2			
Yes	85	5	90
No	5	5	10
Total	90	10	100
Kappa = 0.44			
Situation (b)			
Examiner 2			
Yes	45	5	50
No	5	45	50
Total	50	50	100
Kappa = 0.80			

erate and 0.80 as very good), respectively. Kappa value also depends on the number of categories.^{2,5,6} Applying weighted kappa in such a situation is preferable. Moreover, ROC and AUC are usually used to evaluate the accuracy of a diagnostic model. Sensitivity and specificity, as well as PPV, are among the well-known estimates with which to assess the validity (accuracy) of a single test compared to a gold standard.^{2,6} The aforementioned estimates have nothing to do with prediction.^{3,4,6} To predict an outcome, we need data from two different cohorts or at least from one cohort divided into two to first develop a prediction model and subsequently validate it. Misleading results are generally the main outcome of research that fails to validate its prediction models.^{3,4,6} Any conclusion on reliability and prediction should be supported by the aforementioned methodological issues.^{2–6}

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Response

We thank Dr. Sabour for his interest in our recent publication, and as always we are grateful when statistician experts take the time to review and guide our work. There are some points that need clarification. In our paper on the reliability of MRI for the diagnosis of NVC in the context of TN, no outcome data have been analyzed and therefore no prediction on outcome has been inferred. The only prediction attempted was to assess the ability of MRI to describe an NVC in patients with TN. In order to do this, we blindly assessed preoperative MR images for features of NVC and then compared them to a gold standard of diagnosis in the field: that is, surgical exploration and observation during MVD surgery. Correspondence between our diagnostic test (preoperative MRI) and the gold standard currently available for diagnosis of conflict-related TN (direct anatomical observation during surgery) was quantified using ROC curves that combine both sensitivity and specificity. ROC curves were used in this to assess the ability of our diagnostic test at different thresholds (degrees of conflict). This is precisely what ROC curves were designed to do,⁴ and they allowed us to select grade 1 as having the best balance between selectivity and specificity and therefore—at least at this time—being the optimum diagnostic threshold for NVC in TN patients.

Cohen's kappa² has been previously used to assess diagnostic concordance in TN in previous work on imaging of TN patients.⁵ It has the disadvantage of being sensitive to prevalence in each category. However, in this setting, where a gold standard diagnostic option is used to compare the usefulness of another diagnostic option and a given high and constant prevalence (presumably) of positive diagnosis at surgery, Cohen's kappa reflects quite accurately the quality of the diagnostic tool.³ It also can be compared to previous work. Additionally, in order to compensate for Cohen's kappa inaccuracies, we introduced the ROC analysis in addition to pure sensitivity, specificity, and PPV.

The information contained in this work pertains to the quality of the diagnostic value of an NVC seen on preoperative MRI following a standardized protocol. Better studies can be imagined in this field, and most certainly will be performed; however, so far better data are hardly available.¹ This makes it very valuable information that, with the current standardized protocol of MRI, grade 1 conflict is the optimum cutoff for retaining NVC.

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Questionable value of 7-T MRI in Cushing's disease and relationship to inferior petrosal sinus sampling

TO THE EDITOR: We read with great interest the case report by Law et al.⁶ (Law M, Wang R, Liu CSJ, et al: Value of pituitary gland MRI at 7 T in Cushing's disease and relationship to inferior petrosal sinus sampling: case report. *J Neurosurg* [epub ahead of print March 23, 2018. DOI: 10.3171/2017.9.JNS171969]). In this article, the authors reported on a 27-year-old woman with Cushing's disease (CD) in whom the results of 1.5- and 3-T MRI were negative while those of 7-T MRI showed a hypointense focus on the right side of the pituitary gland. Inferior petrosal sinus sampling (IPSS) suggested a right-sided adrenocorticotrophic hormone (ACTH)-secreting adenoma. Permanent histopathology specimens showed suggestive but not definitive signs of an ACTH-secreting adenoma. Postoperatively, the patient received symptomatic and cortisol remission. The authors concluded that 7-T MRI may preempt IPSS to identify the location of a CD microadenoma, which was a very interesting but questionable speculation.

We cannot deny that 7-T MRI may help the radiological diagnosis of CD in the future. But it is hard to agree on the point it will preempt or replace IPSS.

First, as the current gold standard, IPSS shows its strongest value in determining the origin of Cushing syndrome (CS), with a sensitivity of 95.57% and specificity of 100% in the diagnosis of CD.⁴ The newly detected hypointense

focus by 7-T MRI, as stated by Law et al., only suggested the lesion in the pituitary gland, but still cannot confirm that it is the hypercortisolism origin of CS by purely imaging methods. Because pituitary incidentalomas, such as nonfunctioning adenoma or small Rathke cysts, occur in 10%–38% of these patients, they may also show hypointensity on MRI.^{3,5} In addition, the case reported by Law et al. showed a negative histopathological diagnosis of ACTH-secreting adenoma, but the presence of Croke's changes that only suggest CS, without differentiating CD and ectopic ACTH syndromes.⁷ Therefore, we cannot just draw the conclusion that 7-T MRI may preempt IPSS based on this histopathologically negative case report. From the clinical experience in our national pituitary center, the combination of dynamic-contrast MRI, low- and high-dose dexamethasone suppression test, and IPSS can locate the microadenoma to the maximum extent.^{8–10}

Second, although the brain structure, especially brain nuclei, could be exhibited more clearly on 7-T MRI, the spatial resolution of the pituitary structure is not evidently improved on 7-T MRI compared with 1.5- or 3-T MRI. A susceptibility artifact can be created at the skull base by 7-T MRI because the sellar region lies right in the bone-air boundary.^{1,2} Therefore, the hypointense focus that appears on 7-T MRI, where it did not on 1.5- or 3-T, might just be the artifact formed by the ultra-high field. Further studies enrolling more participants using 1.5-, 3-, and 7-T MRI should be conducted in the future.

In conclusion, considering 7-T MRI is currently still an experimental and expensive modality, more studies are needed to evaluate the actual clinical advantages of 7-T MRI in CD before we can safely say that 7-T MRI could preempt IPSS to identify the location of CD microadenoma.^{1,3}

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Response

We thank Drs. Wang, Gao, and Xing for their letter to the editor.

First, we agree that currently there will be a place for IPSS in patients with CS, along with dynamic-contrast MRI. It is also well known that these adenomas are sometimes challenging to detect with MRI. As our paper is a case report, we are not suggesting that 7-T MRI can replace IPSS, but as we scan more patients at 7 T, we will learn of its value as a diagnostic adjunct to IPSS.

Second, we also agree that neuroimaging and particularly pituitary imaging at 7 T is still very challenging due to the air-bone interface, susceptibility artifacts, geometric distortion, and inhomogeneity in the central skull base. Since the publication of this article, a number of neuroimaging colleagues have communicated their efforts to optimize pituitary MRI at 7 T using dielectric pads, parallel transmit technology, and even filling the sphenoid sinus with fluid (which we are not suggesting) to improve the image quality. We are undertaking further comparisons of patients with pituitary adenomas at 1.5, 3, and 7 T and will continue to optimize our protocol and approach.

Finally, the 7-T MRI utilized in this study is the first 7 T to be FDA approved in the US and has Conformité Européenne (CE) clearance in the European Union for clinical 7-T MRI. Therefore, even though we agree that the majority of 7-T MRI machines around the world are experimental, research-only instruments, the one installed at our institution has been designed by the manufacturer specifically with clinical neuroimaging in mind. We hope, in collaboration with a small number of installed sites that have this unique scanner, to be able to explore its capa-

bilities clinically and report back to the readership in due time.

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Limited data?

TO THE EDITOR: I found the article by Durham et al.⁴ very interesting (Durham SR, Donaldson K, Grady MS, et al: Analysis of the 1990–2007 neurosurgery residency match: does applicant gender affect neurosurgery match outcome? *J Neurosurg* 129:282–289, August 2018). I have a question and a comment. I was wondering what was meant by “limited data” since there are 3426 subjects in their study. I perused the rest of this August issue of the *Journal of Neurosurgery*, and only 5 of about 25 papers had the same order of magnitude of subjects. The latter papers do not apologize for the number of subjects and describe their data as a “large (patient) series,” “nationwide analysis,” and “very large cohort.”^{3,5,8}

My comment is that the authors’ conclusions seemed tepid. Their study included 3426 applications, although there was substantial missing data for some variables like the United States Medical Licensing Exam (available for 1858 [54%] of 3426 applications). Multivariable analysis found that females had an OR of 0.57 (95% CI 34%–94%) of matching. This was in a model adjusted for all covariates, although I am not sure what those are (the only other variable being year of application). So females had about half the chance of matching as males. Durham et al. concluded that applicant gender may play a role in neurosurgery residency match outcome. Yet the conclusions of many of the other papers in the same issue, based on 1 or 2 orders of magnitude fewer subjects, none of which arguably would be considered adequate, well-controlled clinical trials, included statements such as the reported treatments or diagnostic strategies were “safe and effective,” “reliably able to identify,” “highly effective,” “excellent local control,” and “100% sensitive and specific.”^{1,2,6,7,9}

Based on this cursory assessment, it seems like the conclusions of Durham and colleagues should be more to the effect that female gender is a powerful negative predictor of matching to a neurosurgery residency.

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Disclosures

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Response

We thank Dr. Macdonald for his careful reading and analysis of our article. We agree that the cohort was rela-

tively large and may seem even more so compared with those in clinical studies. However, we are also aware that a resident cohort is not the same as a patient one and were mindful of the limitations of the multivariate adjusted model, as the historical data set we were using was quite limited.

As this is the first paper exploring the topic of gender bias in the neurosurgical match process, we were very sensitive, perhaps to a fault, of how to present this conclusion. We agree that the data is very suggestive of the conclusion stated by Dr. Macdonald, i.e., that “female gender is a powerful negative predictor of matching to a neurosurgery residency.” However, several of the reviewers felt that the statistical analysis did not warrant a conclusive statement such as this in the published paper, so adjustments were made accordingly. Ongoing research on this and related topics will, we hope, help neurosurgery to be best positioned to attract and retain the best and brightest applicants for our specialty.

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A resident's view of Penfield's Montreal Neurological Institute

TO THE EDITOR: We read with interest the article by Leblanc¹ (Leblanc R: Cushing, Penfield, and cortical stimulation. *J Neurosurg* 130:76–83, January 2019), revealing Cushing's sketches of epileptogenic foci shared with Penfield, and highlighting valuable archival discoveries resulting from research for the lucid and very seriously well-documented book *The Wounded Brain Healed* by W. Feindel and R. Leblanc (McGill-Queen's University Press, 2016) that documents the history of the Montreal Neurological Institute (MNI).

As an adjunct to these works by Leblanc and Feindel, we share with the readership the comments of an MNI-trained neurosurgeon about the memories of his own personal, direct, learning, life experience as a resident at Penfield's MNI (Fig. 1). These reflections were solicited from the senior author (C.V., born 1927) by two of his pupils (B.B. and F.H.). They were read for the first time at our institution's annual Neurosurgery Research Day and Vera Lecture in April 2018:

A particularly important aspect of the grand experience I had working, collaborating and learning at MNI during the late fifties and early sixties, was living in the atmosphere that prevailed among some resident physicians there. It used to make

one feel as if one was being sucked up into the cyclone of the intellectual high-altitude wind of a very powerful dreamer—a dreamer who was trying to make understandable the immense complexity of the neuronal engine that keeps the human mind functioning. There was at that place an atmosphere of breath-taking anticipation and expectation of a possible new finding that could come at any time, whether from the operating theaters or from some of the laboratories. It was the living “sense of discovery” that I heard Dr. Penfield mention more than once.

Some of the research projects could be encouraged, at their initiation, to recruit a resident as co-worker, requesting his or her collaboration, dedication, learning, and ability. To be recruited was considered an engaging vote of trust; recruitment represented a confidence in the best that someone could contribute to a very important common cause. Dr. H. Jasper, and very much Dr. P. Gloor assigned me, and to my luck, made me team up with Dr. Luigi Sperti from Padua to collaborate on a project to find out the role of dendrites in the epileptic discharge. Several articles on the subject came from it.

While I was assisting Dr. Penfield in an operation undertaken to treat cerebral seizures, he asked me to insert a linear array of electrodes under the dura past the durotomy incision line, sliding it over the cortical surface “very carefully” to avoid, by touch, damage to adjacent cortical veins. He said to me, “You can do that very well.” After that, I felt that I could not do, for the rest of my life, anything else but neurosurgery. Still, just as important to me was that similar episodes also showed me how a great leader captures first and forever the hearts and consciousnesses of those he leads. Also, that the great dreamer with whom I had been accepted to collaborate had to have an absolute intellectual honesty, with total adherence to the logical principles on which his dream was founded.

A crucial feature of the teaching I received at the MNI, which I hold as one of my dearest treasures, was that my hand did not have to be forced to show me how a particular maneuver was supposed to be done (“no spoon feeding at MNI” was a phrase often heard). Instead, I was encouraged to learn as an adult, choosing on my own the dexterities I knew worked best for me, thus encouraging in me a natural style of moving and doing. Penfield's past performance revealed the great visionary that he was. He had the courage (perhaps even the temerity) to venture into different disciplines requiring and using at the time new or nascent ways of scientific exploration. He had made his contribution to the world of morphology with his work on the microscopic anatomy of nerve cell pathology while working with Pio del Rio Ortega in Spain, adding something of importance to the monumental work of S. R. y Cajal. By incorporating the enormous contribution of the electrophysiology of Sherrington to morphology, he increased spectacularly with life (i.e., in living, conscious humans) the conquests of the microscope with those of the electrical stimulator and electronic amplifier and oscilloscope.

Penfield's gigantic stature loomed large in projecting his reach into a dimension that became transdisciplinary, transgenerational, and transnational; he inspired and influenced those who have followed him to labor in a quest for the future that still goes on today.

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FIG. 1. Staff of the MNI surrounding Dr. Penfield (second row, sixth from left) during the 1960s. Dr. Vera (first row, fifth from right) sits beside his future chairman Dr. Phanor Perot (first row, sixth from right), who later recruited him to the Medical University of South Carolina. Reprinted from Twenty-Fourth Annual Report, 1958–1959. Montreal Neurological Institute Archives. All rights reserved.

FIG. 2. Training at the MNI. Penfield is seen in the gallery of OR No. 1 instructing his resident, William Feindel, who was later Director of the MNI. An electroencephalograph with a microphone for communication between the electroencephalographer and the surgeon during electrocorticographic recordings is seen in the foreground. Reprinted from Feindel W, Leblanc R: *The Wounded Brain Healed—The Golden Age of the Montreal Neurological Institute, 1934–1984*. Montreal: McGill-Queen's University Press, 2016. All rights reserved.

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Disclosures

The authors report no conflict of interest.

Supplemental Information

Previous Presentations

This vignette was delivered orally for the first time at the annual Department of Neurosurgery Research Day and Vera Lecture at the Medical University of South Carolina in April 2018 as part of graduation exercises.

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Response

Dr. Vera gives a heartfelt account of his experience while training in neurosurgery at the MNI. I have often heard similar comments over the years from Dr. Vera's contemporaries who, as he did, contributed to the academic life of the Institute and then to academic neurosurgery. I would like to underline one point that Dr. Vera makes: the great respect for the cortex that Penfield instilled in all of his trainees, and that continues to be a hallmark of our teaching at the MNI (Fig. 2).

I would like to comment on the photograph accompanying Dr. Vera's letter. It was originally published in the *MNI Annual Report* for the academic year 1958–1959. Readers will be interested in the identity of some of the residents and fellows besides those identified by Dr. Vera, and in the positions that they later attained. In the bottom row are Perry Black, Professor and Chairman of Neurosurgery, Hahnemann University Hospital (No. 2 from the left); Charles Branch Sr., University of Texas Health Science Center at San Antonio (No. 7); Des Raj Gulati, Chairman of Neurosurgery, the Postgraduate Institute of Medical Education and Research, India (No. 10); and Jesse Barber Jr., Chairman of Neurosurgery, Howard University (No. 12). John Jane, Professor and Chairman of Neurosurgery at the University of Virginia, is fifth from the left in the fourth row. (Jane was later the editor of the *Journal of Neurosurgery*.) In the top row are Richard Rovit, Professor and Chairman of Neurosurgery, New York University School of Medicine (No. 1 on the left), and Henry Garretson, Professor and Chairman of Neurosurgery, University of Louisville School of Medicine (No. 8).

Jesse Barber requires special mention. Jesse Barber followed Clarence Greene Sr. as Chairman of Neurosurgery at Freedmen's Hospital—now Howard University

Hospital—in Washington D.C. Greene was the first African-American neurosurgeon in the United States. He had trained in the discipline with Wilder Penfield, William Cone, and Arthur Elvidge at the MNI. Jesse Barber had been Clarence Greene's resident at Freedmen's Hospital and he came to the MNI in 1958, after Greene's passing, to complete his training in neurosurgery. Ten neurosurgery programs in the United States had rejected his application for residency training before Penfield accepted him. Barber left the MNI in 1961 to become Chief of Neurosurgery at Howard University, where he remained for the next 22 years. During that time, Maitland Baldwin, who was the first Head of Neurosurgery at the National Institute of Neurological Diseases and Blindness (Bethesda), and who also had trained at the MNI, often aided Barber on the neurosurgical service at Freedmen's Hospital.¹ These are the types of individuals who, like Dr. Vera, trained in neurosurgery at the MNI.

There are 3 visitors from behind the Iron Curtain in the fourth row of the photograph. They are: Georgiy Smirnov, U.S.S.R. Academy of Sciences (No. 6 from the left); Jerzy Bidziński, Neurosurgeon, Academy of Medicine, Warsaw (No. 8); and Adam Stepien, Professor and Chairman of Neurosurgery, Academy of Medicine, Warsaw (No. 10).

The presence of Georgiy Smirnov and Herbert Jasper (second row, No. 11 from the left) in the same photograph is of historical interest. The two met at the "The Moscow Colloquium on Electroencephalography of Higher Nervous Activity" in 1958. From that meeting arose the International Brain Research Organization (IBRO) in 1960, of which Smirnov and Jasper were founding members. This was an astounding accomplishment for both men at the height of the Cold War.

Those interested in the contributions of the MNI to American and world neurology, neurosurgery, and neuroscience are referred to Feindel and Leblanc's book *The Wounded Brain Healed—The Golden Age of the Montreal Neurological Institute, 1934–1984* (Montreal: McGill-Queen's University Press, 2016).

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